Res Dev Med Educ, 2024, 13, 17
doi: 10.34172/rdme.33200
https://rdme.tbzmed.ac.ir

Original Article

Experiences of dental students in virtual education: A qualitative study

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Article info
Article History:
Received: February 7, 2024
Accepted: April 10, 2024
epublished: November 11, 2024

Keywords:
Virtual education, Dentistry, E-learning, Qualitative study

Abstract

Background: Virtual education, adopted and utilized as a reaction to global changes, has brought about challenges and opportunities to many medical schools worldwide. This study aimed to shed light on the experiences of dental students with virtual learning in theoretical courses.

Methods: This qualitative-descriptive study was conducted in 2022 using semi-structured interviews with open-ended questions. The 15 interviewees were selected purposively and based on theoretical methods to obtain the most information. The interviews were analyzed using the conventional qualitative content analysis method. MAXQDA version 11 software was used for open coding and categorizing codes.

Results: Two main categories (themes) were obtained under the headings of perceived disadvantages and perceived advantages of virtual education. From the perspective of students, the disadvantages of virtual education were categorized into 10 sub-themes such as infrastructure problems and low interaction, and its advantages were categorized into 5 basic concepts such as ease of access to faculty and students and flexibility in training time. 145 open codes were primarily extracted from interviews.

Conclusion: Online learning due to the conditions of nowadays world and the occurrence of extensive changes, including biological crises such as the COVID-19 pandemic, has encountered some advantages and disadvantages. The inevitability of future threats, whether biological or man-made, accentuates the importance of studies like this. Such research can be of interest to policymakers and educational administrators in assessing the effectiveness of education in similar conditions future.

Introduction

The growth of a society is complex and multi-dimensional; that is, in terms of the development of a society, in addition to the improvement of the economic situation, the advancement of the technological level, and the increase of the national wealth, there must be fundamental quantitative and qualitative changes in the political, social, economic and cultural structure. Achieving these goals cannot be possible without paying attention to education.[1] In general, education is a process in which establishing a defined relationship between the teacher and the learner leads to improving knowledge, increasing information, acquiring skills, as well as leading to changes in the mental and practical abilities of the learner.[2] Student engagement has been the focus of a significant amount of research in recent years as an important factor for learning outcomes in higher education. Medical education researchers emphasize student engagement as a key element in developing higher education outcomes.[3]

Medicine is a constantly evolving profession, especially with the advent of rapid advances in the scientific foundation that underpins the profession. Medical education also played a great role in human health in the 20th century. Undoubtedly, the training of thousands of experts at different levels in medical sciences played a fundamental role in reducing human mortality.[4,5] The world today is increasingly interconnected and globalization now affects almost every individual's life. The increased flow of people, products, services, and information between countries and continents has a

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tremendous impact on health and healthcare delivery in the world.[6] To ensure that education in medicine is contemporary with the continuous evolution of the profession, many changes have in postgraduate medical education worldwide. Among the key related changes in postgraduate medical education during the 21st century, we can mention the changes in the structure, governance, and setting up of virtual education.[7]

Virtual education generally refers to education in a learning environment where the teacher and student are separated by time or place or both. The content of the course in this educational method is transmitted through information technology applications, multimedia resources, the Internet, video conferences, etc. Virtual education is an effective method that uses information and communication technology in education with a combination of digital content, and provides a reliable and efficient communication platform so that students can learn from this innovative educational package at any time and place they want.[8,9]

Virtual education has some positive and negative points. For example, contrary to the appearance of online education, it seems that the communication between the student and the professor is cut off, in many cases it increases the interaction between the student and the professor because most online education systems have chat and discussion rooms, giving feedback to assignments that in many cases were not done in face-to-face classes. Furthermore, due to the flexible nature of virtual training, it is relatively easy to use.[10]

Despite the advantages of virtual education, the primary disadvantages of online learning are technical issues and student isolation. Some students miss the interaction in a traditional classroom, while self-directed learners are more successful in online learning.[11] Moreover, virtual education needs infrastructure that countries should strengthen.[2] Regarding the virtual education of dentistry students, due to the nature of the field and the practical nature of most of the courses, the students' experiences will be different. Here are some potential experiences and challenges faced by dental students during virtual education: (1) The disruption of clinical training: dental education heavily relies on hands-on clinical training, which was significantly disrupted during virtual education. Many dental students missed out on valuable patient interactions and practical experience in virtual education. (2) Adjustment to online learning: dental students had to adapt to virtual lectures, webinars, and online simulations, which required access to appropriate technology and a stable internet connection. Some students found it challenging to stay engaged in online classes. (3) Lack of practical experience: the absence of in-person clinical experience created concerns about the readiness of dental students to provide patient care after graduation. Students missed out on opportunities to practice procedures and techniques on real patients. (4) Mental health and stress: challenges of virtual learning led to increased stress and anxiety among dental students. The uncertainty surrounding licensing exams and clinical requirements added to the pressure. (5) Innovations in virtual education: some dental schools and educators adapted by developing innovative virtual learning tools, including virtual patient simulations, interactive case discussions, and telehealth experiences. (6) Support and communication: effective communication between faculty and students became crucial during the transition to virtual education. Some students reported feeling disconnected from their professors and peers and desired more support. (7) Evaluations and assessments: dental schools had to modify their assessment methods to accommodate remote learning. This included virtual examinations and alternative ways to assess clinical competencies. (8) Mixed feelings: some students appreciated the flexibility that online learning offered, while others missed the traditional in-person interactions and clinical experiences.[12]

It is important to know that the experiences of dental students regarding virtual education, may vary widely depending on the country, institution, the resources available, and the specific measures taken by dental schools to address the challenges. Therefore, this study aimed to investigate the experiences of dental students in the basic science section at Tabriz University of Medical Sciences regarding virtual education.

Methods

This study was designed and implemented to understand the experiences of dental students in the basic sciences section regarding virtual education at Tabriz University of Medical Sciences in theoretical courses.

Study design and setting

The present study was conducted using a qualitative descriptive methodology, in which we aimed to provide a comprehensive summary of the experiences of dental students on virtual education. This study was designed and implemented in Tabriz, Iran, from January 2021 to October 2022. The present research was conducted in the Faculty of Dentistry at Tabriz University of Medical Sciences.

Study participants and sampling

Sampling was performed purposively, in which, the interviewees were selected by the researcher with the special purpose of having the high amount of information and ability to explain their experiences to participate in the study. The inclusion criteria include dental students with different ages, genders, and years of entrance to gain information. All dental students of basic sciences who were willing to participate in the study were included. Students who withdrew from the study for any reason, such as study leave and guest students of a single subject, were excluded from the study. Sampling continued until

saturation was reached.

Data collection technique

The data were collected using semi-structured with open-ended questions conducted individually. The objectives and methods were briefly explained to the selected students during a phone call by the research team and then they were interviewed. The location of the interview, which was often chosen based on the opinion of the participants, was one of the classrooms of the dental school or the workplace of the researchers. The participants were given a commitment that they could withdraw from the study at any stage of the study. Interviews with the participants continued until the research team members concluded that conducting further interviews would not add new data and the emergent themes were repeated. In the present study, after conducting 13 interviews, saturation in the findings was achieved. To ensure saturation, 2 other interviews were also conducted.

An interview guide was developed based on the aims of this research. The interview guide included the objectives, the topic of the study, demographic information of the interviewees, and interview questions. After conducting 3 pilot interviews and analyzing the findings, the interview questions were adjusted and the interviews continued with the adjusted format. The interviews started with an indirect question and to avoid bias and get rich information, the questions were asked in general at the beginning. "Please explain one of your theory courses that are held online or in the learning management system?" In the continuation of the interview, exploratory and more detailed questions were asked if necessary, including, 'What do you mean by...?' "Can you explain a little more about you?" Can you give an example, please?' Finally, the last question of the interview was, How did it make you feel at that time?'

Participants were asked to record their voices. Also, in addition to the digital recording of the interview, observation and note-taking were used to record the tone of voice, body posture, and gestures of the participants.

Data analysis

In this study, qualitative content analysis with a conventional approach was used for data analysis.[13] MAXQDA version 11 software was used for coding and categorizing codes. In this approach, data analysis begins by reading the entire text repeatedly to gain a complete understanding of it. Then, the texts are read verbatim to extract the codes. At first, the objective words of the text that seem to contain the main concepts are identified. The researcher advances the text by taking notes from the initial analysis and this work continues until the background for the emergence of codes begins. During this process, code labels that represent more than one main idea are identified; these items are extracted directly. Then the codes are classified based on their difference or relationship with each other. Ideally, the number of classes is between 10 and 15 to be sufficient for classifying a large number of codes. The main advantage of qualitative content analysis based on the conventional approach is to obtain direct information from the study without imposing predetermined categories or theories.[14] In this research, the contractual content analysis method was used according to the steps proposed by Graneheim and Lundman.[15,16] With this method, in addition to the obvious content of the interview texts, its hidden content and concepts with different levels of abstraction can also be obtained, so based on this method, the following five steps were performed:

1. Writing the entire interview immediately after each interview
2. Reading the whole text several times to get a general understanding of its content
3. Dividing the text into semantic units, extracting a summary of the semantic units, and coding
4. Classifying primary codes into subclasses and classes based on comparing their similarities and differences
5. Extracting themes as an expression of the concept and content hidden in the data

The rigor of the study

To ensure the reliability and rigor of the data collected in this study, the following measures were taken based on four criteria for evaluating the accuracy of qualitative studies[17,18]:

A. Acceptability (Credibility); in this study, close, long, and continuous interaction with the participants and continuous effort in the research was done to increase the validity of the study findings. Also, in the present study, the researcher tried to verify the accuracy of the data by some participants (member Check) and seek agreement between the members of the research team (peer review) in the process of coding and analyzing the data.
B. Dependability; in the current study, the text of the interviews and codes were reviewed by professors with experience in qualitative research, and in cases where there was a lack of agreement, discussions and clarifications were made to reach a consensus.
C. Confirmability; in this research, several solutions were implemented to increase the verification capability. An important tool was to set aside the researcher's opinions, which was done in the present study. Publishing the results of the study in the journal is another way to increase the confirmability of the present study.
D. Transferability; in this study, both the research environment and the participants, as well as the flow and process of selecting the participants, interviewing, and analyzing the study were fully described to provide readers with the possibility of judging the generalizability of the findings.

Authenticity; in this study, quotes from different

participants were included; ensuring that identification codes comply with data protection guidelines and cannot be used to identify participants.

Results

In this study, the experiences of students of the basic sciences of the dental school about the advantages and disadvantages of virtual education were investigated. A total of 15 interviews were conducted with students of basic sciences in dentistry. In addition to the students, one of the interviewees was an expert in charge of conducting online courses, who was selected and interviewed due to her information and interest in participating in this study. Interviews were conducted from May 2021 to December 2021. The duration of the interviews was between 32 and 46 minutes. All the interviews were recorded after giving the necessary explanations about the objectives of the study and obtaining informed consent from the interviewee. All interviews were conducted face-to-face. The characteristics of the interviewees are presented in Table 1.

The main findings of the study

In this study, after analyzing the findings and the codes obtained from the interviews, two main categories were obtained under the headings of perceived disadvantages and perceived advantages of virtual education.

Perceived disadvantages of virtual education

In their interviews, the students mentioned disadvantages in 10 subcategories, including problems related to infrastructure, double difficulty for new students, low interaction with other classmates and professors, impairment in learning and understanding concepts, problems related to learning style students, problems in the field of educational management, disruption in the formation of students' professional behavior, challenges related to the learning management system, challenges related to virtual assessment and low media literacy. The perceived disadvantages of virtual education are shown in Table 2.

Problems related to infrastructure

In this subcategory, students mentioned the problems existing in the infrastructure of virtual education they faced. The infrastructure for establishing virtual education is one of the most important things that should be considered in promoting virtual education. The primary concepts extracted from the interviews include hardware and software problems, as well as problems concerning the Internet, and finally, the negative impact of these problems on students' interest and morale in studying and learning. Regarding this, one of the students declared,

"Most of them had a very poor voice. Now I don't see the professors who used the system, the problem was with their voice system or now their voice had a problem. Unfortunately, their voice acting was very weak and we could not understand them in many places."

Another participant said,

"... and this made the students lose their interest to participate in the class"

Table 1. Demographic characteristics of participants

Qualitative variable			Number (%)
Gender	Male		9 (60)
	Female		6 (40)
Address	Native		9 (60)
	Non-native		6 (40)
Quantitative variable			
Variable	**Minimum**	**Maximum**	**Mean (SD)**
Age	21	59	24.4 (9.61)

Double difficulty for new students

In addition to its well-known difficulties, virtual education also has additional problems for newly arrived students, as mentioned in their interviews by the students. For example:

"... We didn't understand many parts, especially the scientific terms, and the students were annoyed"

"Even from the rest of my classmates, we didn't have the same communication that we could get along with this issue."

Low interaction with other classmates and professors

The findings of the students' interviews revealed that most of them complained about the lack of interaction and communication with their classmates and professors during class and after the classes for group work. Moreover, the students were dissatisfied with the fact that the discussion taught by the professor was not subject to feedback and class evaluation and they considered it as one of the challenges of virtual education. In this regard, one of the interviewees said,

"And the fact that some of the professors are not cooperating, means that we called them to ask about our problems and they did not answer."

Another participant said:

"In the normal situation, the student comes, first she sees a few other students, she communicates with all the students together, and all the students communicate with the professor".

Impairment in learning and understanding concepts

The students admitted that virtual education has caused disruptions in learning and transferring and understanding the concepts from the professor to the students. As an example:

"In virtual education, students do not study at all".

"Finally, attendance in the class is better now because the student will be in the classroom and they can solve the problems".

Table 2. Perceived disadvantages of virtual education

Sub-theme	Basic concepts
Infrastructure problems	Virtual system hardware problems
	Software problems
	Internet-related problems
	The negative impact of technical problems on students' interest
Double difficulty for new students	The difficulty of learning new terms when entering the university through virtual education
	New semester students' lack of familiarity with the university atmosphere upon arrival through virtual education
Low interaction with other students and professors	Poor response to students' questions by professors
	No obligation to attend class regularly
	The teacher's ignorance of the students' learning rate
	Impossible to get feedback from students
	Impossible to use the teacher's body language in virtual teaching
	Lack of proper communication between students
	Difficulty in communicating
	Poor communication between students
Disruption in learning and understanding concepts	Not covering the lesson plan
	Low student study in online education
	Failure to pay attention to solving the problems of students
Problems related to students' learning style	Less concentration in the online class
	Accumulation of content in virtual education
	Tendency to leave class early
	The need to focus more on online classes
Problems in the field of educational management	Irregular holding of virtual classes
	Low quality of providing practical lessons
	Students not giving importance to some courses
Disturbance in the formation of students' professional behavior	Failure to understand the impact of being in the university environment on personality development
	Not getting the feeling of being a university student
Challenges related to Navid system	Low quality of uploaded educational contents
	Reducing the time of face-to-face classes in combined education
	Lack of proper content coverage
	Low quality of some files uploaded in Navid system
Challenges associated with virtual assessment	Low-quality virtual questions in practical courses
	Leaking questions
	Failure to learn the correct answers to exam questions
	Cheating on the test
	Study less in virtual exams
	System problems
	It is not possible to review the questions in the virtual exam
	It is not possible to return to the previous questions
Low media literacy	Problems caused by lack of familiarity of some people in using computer

Problems concerning the learning style of students

Virtual education has caused some students to face problems in their learning style, which was related to reducing their concentration, accumulating taught topics, and leaving class sessions after announcing their attendance at the beginning of the session. One of the participants declared,

"That is, in the classroom, when the teacher is very serious, for example, when you take your hand to the phone for a moment he tells you not to touch or talk to your classmate. Well, it's not the same problem in an online class."

Or another participant said,

"In general, virtual teaching is something that the student gets bored of, that is, s/he no longer has the passion she has for education, that is, she prefers to just

register her name on the server and leave her phone and go somewhere else."

Problems in the field of educational management

The analysis of the findings from the conducted interviews showed that some problems had occurred in virtual education, which is related to the field of education and the quality of the classes held. The main concepts of these problems include irregular virtual classes, the low quality of practical courses, and students not giving importance to some courses.

One of the participants said,

"Well, the classes were held irregularly, it was not like the university".

Disruption in the formation of students' professional behavior

Some students admitted that the virtual education and distance of the students from the university environment and their friends and classmates had caused these students to feel a lack in their personality development. For example:

"For example, it was university, it had a great impact on the development of a person's personality, and it had a great impact on social attitudes and behavior".

Challenges related to the learning management system

According to many students, they faced many challenges in the field of the learning management system during their virtual education. These problems include the low quality of uploaded educational content, the reduction of face-to-face class time in combined education, the lack of proper content coverage, and the low quality of some files uploaded in the learning management system. One of the participants added,

"Some of them mentioned general difficult topics, for example, biochemistry was very difficult, and they taught us that in an online course."

"For example, the files that are uploaded in learning management*, sometimes the sound was not good, that is, the sound was low, and it was very annoying."*

Challenges related to virtual assessment

Findings showed that the main problems related to virtual education were related to exams and course evaluation, including the low quality of virtual questions in practical courses, missing questions, not learning the correct answers to exam questions, cheating in the exam, studying less in virtual exams, system problems, the impossibility of reviewing questions in the virtual exam, and the impossibility of going back on questions.

In this regard, participants added,

"Now, I don't know if the students used to consult each other, now it was much easier in the online test"

"There were several exams on the site from different universities, which caused the site to become crowded, and the server could not support it."

"Of course, face-to-face exams are much better than virtual exams"

Low media literacy

Finally, in their interviews, the students mentioned some problems in the field of lack of knowledge regarding the use of virtual education tools. For example:

"Another problem was the ability of professors and students to work with software and computers."

Perceived advantages of virtual education

The analysis of student interviews showed that in addition to the disadvantages and weaknesses of virtual education, this type of education also has advantages. These benefits were categorized into 5 primary concepts, which include benefits related to students' access to the classroom, benefits related to ease of access to professors and students, flexibility in teaching time, the existence of a suitable educational portal, and favorable evaluation. Perceived advantages of the virtual education are shown in Table 3.

Benefits related to students' access to the classroom

Students admitted that during their virtual training, they could access their online classroom at different times and places and with different tools. For example:

"The laptop was in front of us that provided a good advantage. This flexibility caused us to access our classes from any location, whether at home or other places using our mobile phones."

Benefits related to ease of access to professors and students

According to the students, virtual education had strong and positive points both for professors and students. Among these strengths, the following can be mentioned: the presence of some students more than expected, the comfortability of taking notes in the virtual class, more focus of the professors on teaching, more mastery of the professors in the virtual teaching, forgetting about the professors in explaining some cases in the face-to-face mode. One of the students added,

"The participation rate of the students was much higher than the professors' expectation."

"... For example, I like to take notes when I listen."

Flexibility in teaching time

Virtual education has made the classrooms of students more flexible than face-to-face education. Students had more time to learn the contents of the system. It was also possible to make up for the lack of class time with the learning management system in virtual education, and professors had more time to explain their educational slides. One of the participants declared,

"Learning management *system, in terms of teaching, was higher; that is because we had enough time for the*

Table 3. Perceived advantages of virtual education

Sub-theme	Basic concepts
Benefits related to student access to the classroom	Access to the class in different conditions
	Ease of access to classes
Benefits related to ease of access to faculty and students	Attendance is more than expected by some students
	The possibility of taking notes in the virtual class
	More concentration of professors in teaching
	More mastery of professors in virtual teaching
	Forgetfulness of professors in explaining some cases in face-to-face mode
Flexibility in training time	More time to learn the content of the system
	The possibility of compensating for the lack of class time with the Navid system
	Possible lack of time to explain the slides in the face-to-face class
The existence of a suitable educational portal	Ability to reuse the class
	A more comprehensive explanation of the contents in Navid's voiced slides
	Fewer software problems in the Navid system compared to online meetings
	Leaking questions
	Failure to learn the correct answers to exam questions
	Cheating on the test
	Study less in virtual exams
	System problems
	It is not possible to review the questions in the virtual exam
	It is not possible to return to the previous questions
Favorable assessment	Feel more comfortable in virtual exams

professors to teach, the files were complete without any problems."

The existence of an appropriate educational portal

According to the students, the educational portal of the learning management system had the following strengths: the possibility of reusing the class, the comprehensibility of the slides with the voice in the learning management system, a more comprehensive explanation of the content in the voiced slides of the learning management system, and fewer software problems in the system in comparison with face-to-face meetings. For example:

"*The learning management system was useful, especially since all the files were available in audio format, making it very convenient.*"

Favorable evaluation

And finally, the students admitted that they felt more comfortable in the virtual exam than in the face-to-face exam. One participant told us,

"*Well, to be honest, the last semester was easier for us because it was conducted online.*"

Discussion

This study aimed to investigate the experiences of students of the basic sciences of dental school about the advantages and disadvantages of virtual education. The analysis of the results showed that one of the main challenges and limitations of virtual education was the reduction of interactions with classmates and professors during this period. Similarly, Khoshnam's study showed that students were affected by their scientific and international interactions, including reducing the use of scientific and non-scientific benefits of study opportunities, including living in a university in another country and becoming a member of international scientific gatherings, as well as the decrease in attendance at international conferences and meetings as a result of virtual education, they had mentioned.[19] Similarly, the results of a qualitative study conducted by Sawari showed that students complained about a decrease in interactions with their classmates and professors with their colleagues during virtual education.[20] The decrease in interaction between professors and students, one-way teaching without interaction, lack of providing feedback, and also the severe decrease in emotional relationships between students and professors were consistent with the study of Rouhi and his colleagues.[21] Similarly, it was shown in Kay's study that students were unhappy and worried that their classmates did not see their professors.[22] Students are not only placed in the educational environment of the university because of acquiring knowledge, but they also seek to strengthen interactions and grow and improve their personality angles. It is necessary to take special measures for interactions between students and professors. For example, systems that expedite active and bidirectional communication between users should be established, along with the necessary infrastructure.

The analysis of this study showed that one of the major challenges faced by students in virtual education was the problems related to the infrastructure of this education, including hardware and software problems, as well as lack of literacy. The results of a review study showed that infrastructural problems and the lack of Internet access in some remote areas in developing countries had led to inequality in the use of virtual education facilities.[23] Similarly, the results of a review study by Dastan showed that the main challenge of online education in Iran's universities of medical sciences was the lack of equal access of students to appropriate hardware, software, and communication tools, insufficient knowledge of students and professors, and unfamiliarity with information technology tools and e-learning.[24]

One of the basic challenges faced by students in virtual education in the present study was the difficulty in transferring concepts and learning. Similarly, Moosavi et al concluded that the limitation in the complete transfer of course concepts and the feeling of the superficiality of the training were the subcategories identified by the university lecturers regarding the challenges of virtual education. In this study, most of the teachers complained that they could not use the virtual education method effectively for many of their practical units.[25] To solve this problem, measures such as setting up systems equipped with two-way and multi-way communication can be useful and effective in providing step-by-step feedback.

The analysis in the present study showed that the students had mentioned the decrease in the quality of virtual exams, the leaking of questions, group answering, and the increase in the amount of cheating as challenges related to the virtual exam. In a completely similar way, Karimian et al, showed that, from the point of view of the professors, one of the most important challenges of electronic education was the electronic evaluation. Since students answer the questions electronically outside the university and through personal computers, it is possible to record the test and publish the questions, and after a short time, the learning value of the questions decreases.[26] It seems that using analytical and open-ended questions instead of multiple-choice questions and increasing the share of continuous and gradual evaluation during the course such as project and practical work can be more effective, reliable, and important.

Based on the results, the low quality of uploaded files in the learning management system was one of the challenges faced by students in virtual education. These findings are consistent with the study of Rambad et al. This study showed that the files sent in the systems were of low quality or the file sizes were high. Furthermore, the delay in uploading files in the system was another the challenge faced by the students.[27] University officials must strengthen online education platforms to support virtual education activities.

Based on the findings of this study, it was concluded that students were satisfied with the ease of access to classes during virtual education. The students were satisfied that they could enter the classroom online at any time and in any place and learn what they learned, and they considered this as one of the most important strengths of virtual education. Khan and colleagues' study in India is consistent with these findings; in this study, because they had easy access to classes and educational resources, the students preferred virtual education as an educational method and only offered suggestions to improve the quality of virtual education.[28] Similarly, Rambad et al in their study concluded that the ease of access to educational content as well as the durability of educational content was identified as one of the important opportunities of virtual education.[27] Mukhtar et al, in their study in Pakistan, showed that convenience and better accessibility were identified as advantages of virtual education from the perspective of faculty members and students of medicine and dentistry.[29]

The study of Rouhi and colleagues similarly concluded that virtual education created opportunities such as flexibility of time and place of education.[21] Moreover, based on the results of Kee's study, students expressed their satisfaction with the opportunities created for them by virtual education such as having enough, and comfortable space to work at home.[22]

The analysis in the present study showed that the facilities of the learning management system, which is one of the virtual education systems in the Iranian universities of medical sciences, were significant and satisfactory. Similarly, the results of the study by Dastani et al showed that the students were satisfied, the learning management system was fundamentally improved and they could review their classes and exercises through this system whenever they wanted.[24] In addition, Ebadi and colleagues' study showed that the students in the Iranian universities of medical sciences consider the learning management system as an effective and supportive educational medium in virtual education.[30]

Strengths and limitations of the study

This study can be used for educational planning because it has deeply examined the experiences of students in medical education. Also, the interviewees have been selected purposively and in such a way that they have the most information and interest to participate in the project. One of the important limitations of this study, like qualitative studies, is the low generalizability of this type of study. Since this study was conducted in Iran, its results can only be used in completely similar conditions.

Conclusion

The global conditions and the occurrence of extensive changes, including biological crises such as the COVID-19 pandemic have increased the need for online learning at all levels, including higher education, and have changed

the perspective of learners. Future threats including biological or man-made threats, are inevitable. Therefore, studies like this can be of interest to policymakers and educational managers regarding the effectiveness of education in similar conditions in the future. The COVID-19 crisis should become an experience for medical schools and academic centers around the world to learn from and prioritize planning for virtual education for medical students and residents. To apply the findings of the present study, as well as to optimize the type of education and benefit from virtual education in some similar situations, it is necessary to make the most of the opportunities and strengths that have been identified. Limitations and weaknesses, as well as the development of virtual education infrastructures in the country, should be done so that higher education in the country can take a growing and desirable path.

Acknowledgments

We extend appreciation to the Tabriz University of Medical Sciences for financial support. This study was conducted as a part of Neda Yasamineh's MSc thesis work.

Authors' Contribution

Conceptualization: Reza Ghaffari.
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Competing Interests

The authors declared no conflict of interest.

Ethical Approval

The current study was approved by the ethics committee of Tabriz University of Medical Sciences (TBZMED.REC.1401.097).

Funding

This study was funded by Tabriz University of Medical Sciences, Tabriz, Iran

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